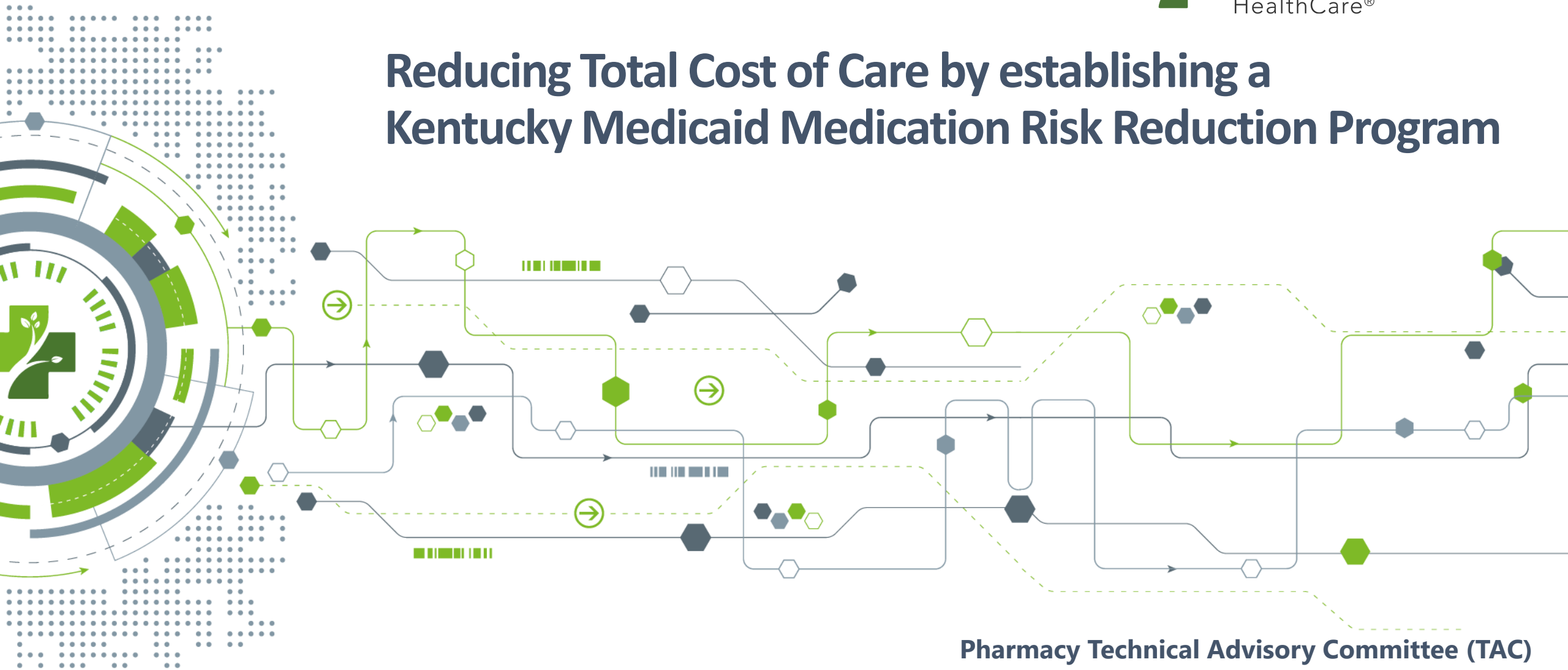
Reducing Total Cost of Care by establishing a Kentucky Medicaid Medication Risk Reduction Program



Pharmacy Technical Advisory Committee (TAC)
August 11, 2021

TABULA RASA HEALTHCARE®

A Hidden Healthcare Crisis – Adverse Drug Events

Medication Risk Identification and Mitigation

The Problem: Leading Causes of Death in the United States

647,457
Heart Disease

599,108
Cancer

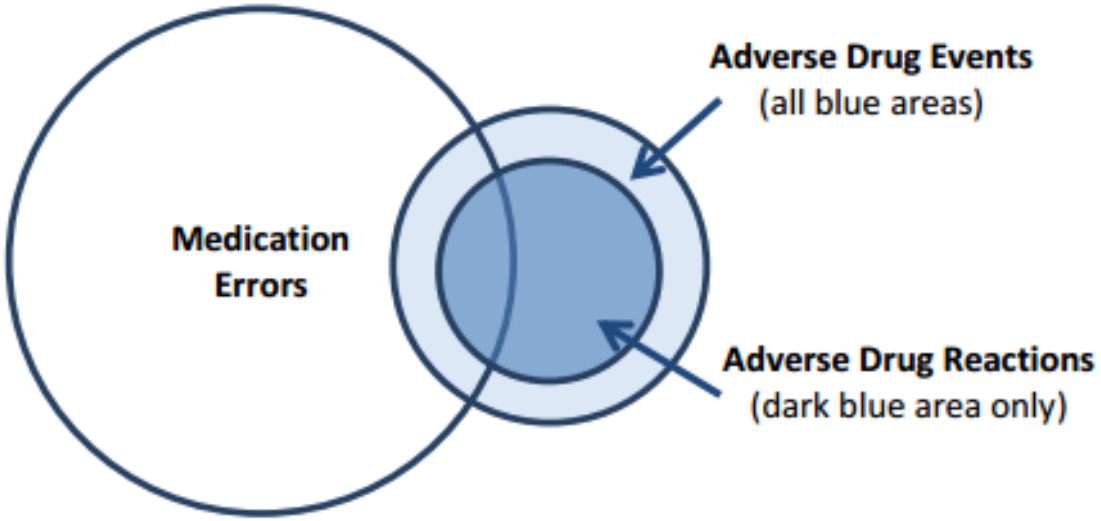
173,000
Adverse Drug Events

Adverse drug events have contributed to 100,000 deaths per year, not including 73,000 opioid-related deaths

1. Centers for Disease Control and Prevention. National Center for Health Statistics. Leading Causes of Death. https://www.cdc.gov/nchs/fastats/leading-causes-of-death.htm. Accessed July 29, 2019.
2. US Food and Drug Administration. Preventable Adverse Drug Reactions: A Focus on Drug Interactions. https://www.fda.gov/drugs/developmentapprovalprocess/developmentresources/druginteractionslabeling/ucm110632.htm. Accessed July 29, 2019.
3. National Institute on Drug Abuse. Overdose Death Rates. https://www.drugabuse.gov/related-topics/trends-statistics/overdose-death-rates. Accessed July 29, 2019.

Typology: Adverse Drug Events are NOT Medication Errors

Figure 1. Terms Relevant to Drug-Related Harm [2]



Aug 2014,
https://health.gov/hcq/pdfs/ade-action-plan-508c.pdf

A **medication error** is defined as "inappropriate use of a drug that may or may not result in harm;" such errors may occur during prescribing, transcribing, dispensing, administering, adherence, or monitoring of a drug.

In contrast, **ADEs** are "harms directly caused by a medication at normal doses."

The Cost of Adverse Drug Events

For every dollar we spend on prescription medication, we spend ***more than another dollar*** trying to address problems caused by normal medication use.

Rx spending versus cost of illness* 1995-2016
(*Drug-related morbidity and mortality)

1. HCUP. Statistical Brief #146, 2013. https://www.hcup-us.ahrq.gov/reports/statbriefs/sb146.pdf
2. NCBI. How much will I get charged for this? 2013. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3584078/
3. U.S. Department of Health and Human Services. Adverse drug events, 2020. https://health.gov/our-work/health-care-quality/adverse-drug-events
4. US Food and Drug Administration. Preventable Adverse Drug Reactions: A Focus on Drug Interactions. https://www.fda.gov/drugs/developmentapprovalprocess/developmentresources/druginteractionslabeling/ucm110632.htm. Accessed July 29, 2019

Adverse drug events (ADEs) are "harms directly caused by a medication at normal doses."

Medications	2+	4+	7+
ADE risk	13%	38%	82%

1.3 million ER visits
Average cost per visit **$1,245**
$1.62 billion annually[2]

2 million hospital stays
Average cost per stay **$9,700**
$19.4 billion annually[1]

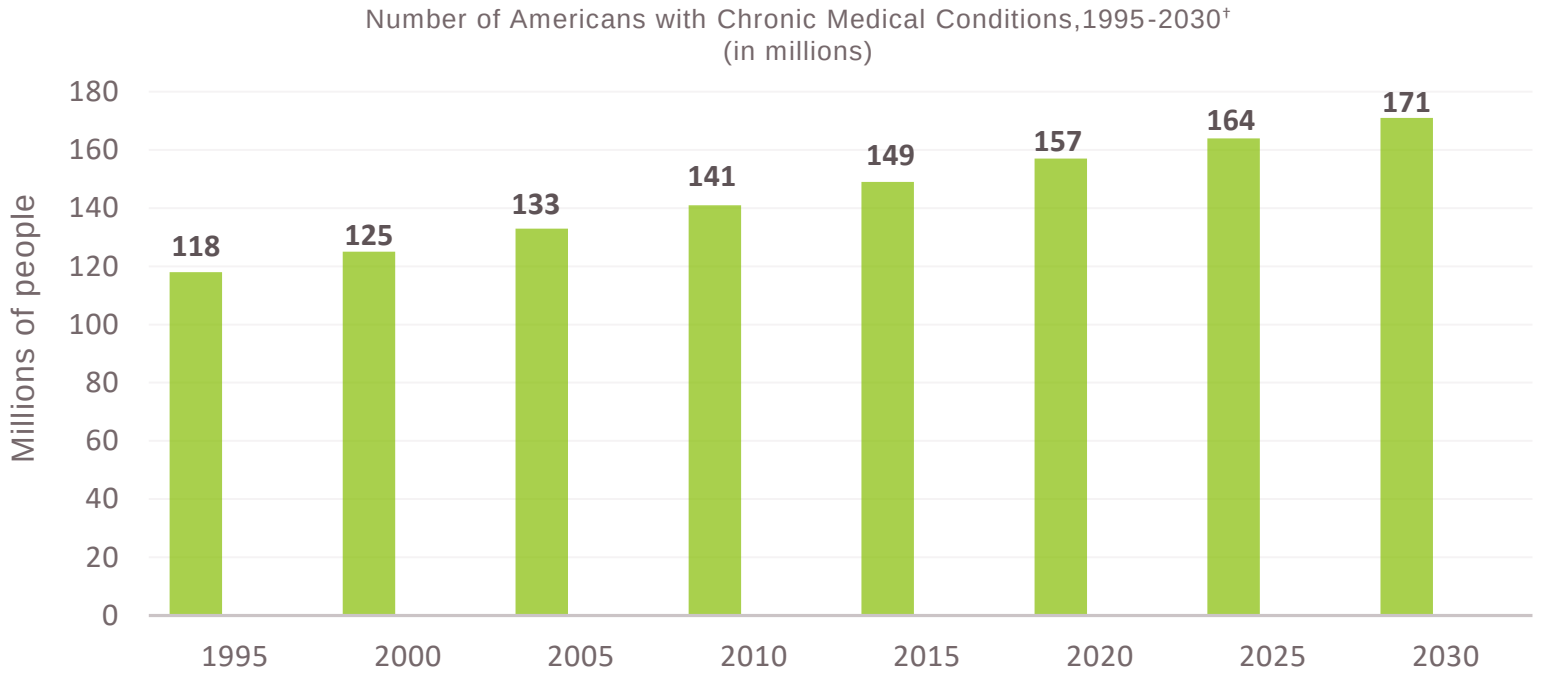
More than 3.5 million physician office visits annually in outpatient settings[3]

ADEs are **the third leading cause of death** (2019)

The Rise of Adverse Drug Events

If current trends continue, medication overload will be responsible for at least **4.6 million hospitalizations** between 2020 and 2030 and will cost taxpayers, patients, and families an estimated **$62 billion**.*

Chronic conditions are on the rise and medications treating them are responsible for a higher prevalence of adverse drug events.



59% of ER Visits from ADEs are associated with:

Anticoagulants

Diabetes Agents

Opioid Analgesics

* Lown Institute Medication Overload: America's Other Drug Problem. Link, 04/01/19
† Values for 2005 to 2030 are projections.
Source: Adapted from Partnership for Solutions. (2002). *Chronic Conditions: Making the Case for Ongoing Care*. Baltimore, MD.

1. NCBI. How much will I get charged for this? 2013. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3584078/
Shebab et al. U.S. emergency department visits for outpatient adverse drug events., 2013-2014. *NIH.gov.* https://dx.doi.org/10.1001%2Fjama.2016.16201

Hidden Dangers and Financial Risk

Traditional payer clinical programs have inadequate outcomes.

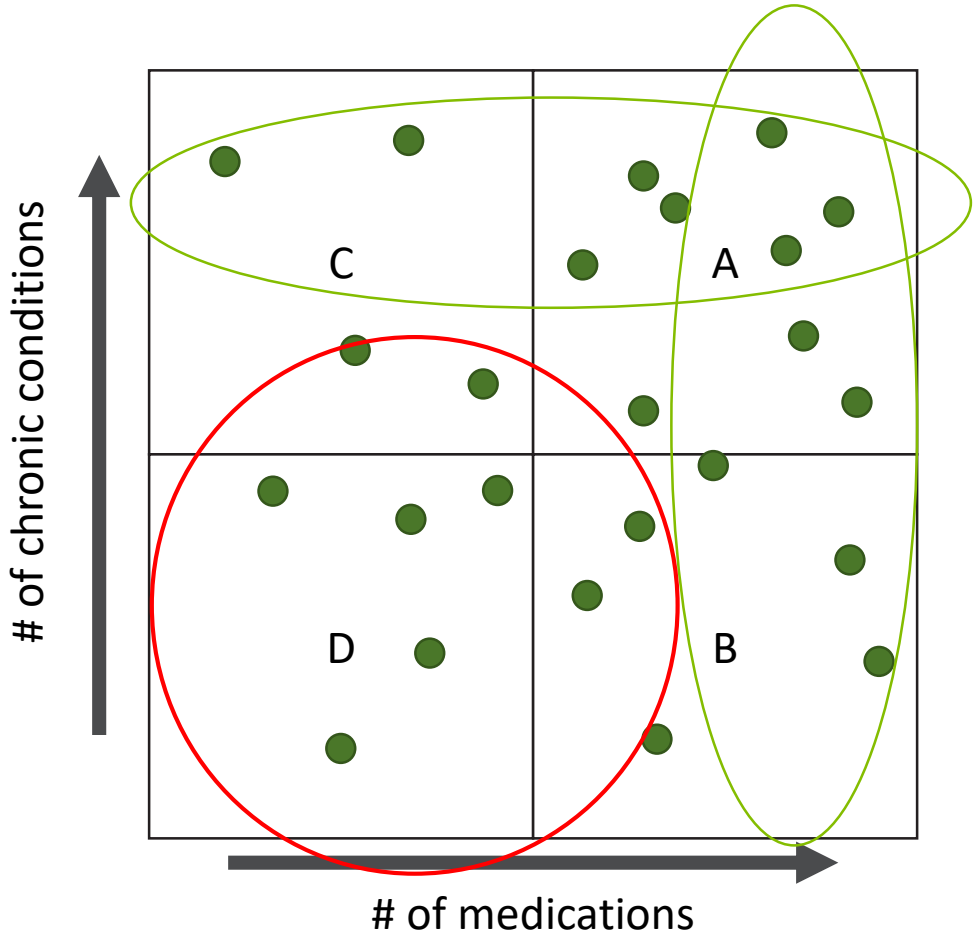
The challenge:

Pharmacy clinical programs have placed emphasis on number of medications, number of chronic illnesses, and high pharmacy spend

- Number of medications is not necessarily associated with risk
- An emphasis on adherence can **increase** risk if not looked at holistically
- Disease management programs can be **siloed**, resulting in missed opportunities to intervene and address risks
- Prescription data analysis for traditional programs is retrospective

Missed opportunities for intervention

Are these your emerging high claimants?



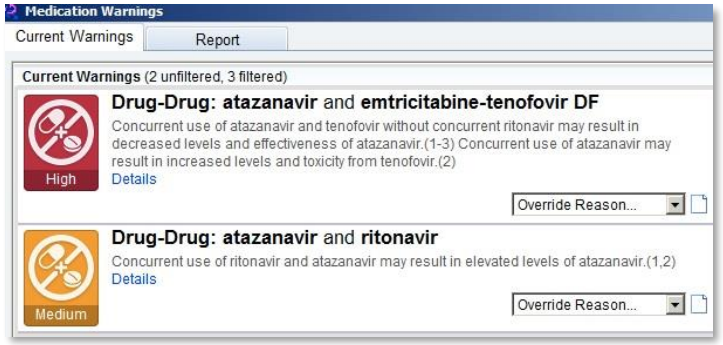
TABULA RASA HEALTHCARE®

Redefining Medication Safety

Medication Risk Identification and Mitigation

TRHC's Solution: MedWise®

Traditional One-to-One Drug Analysis

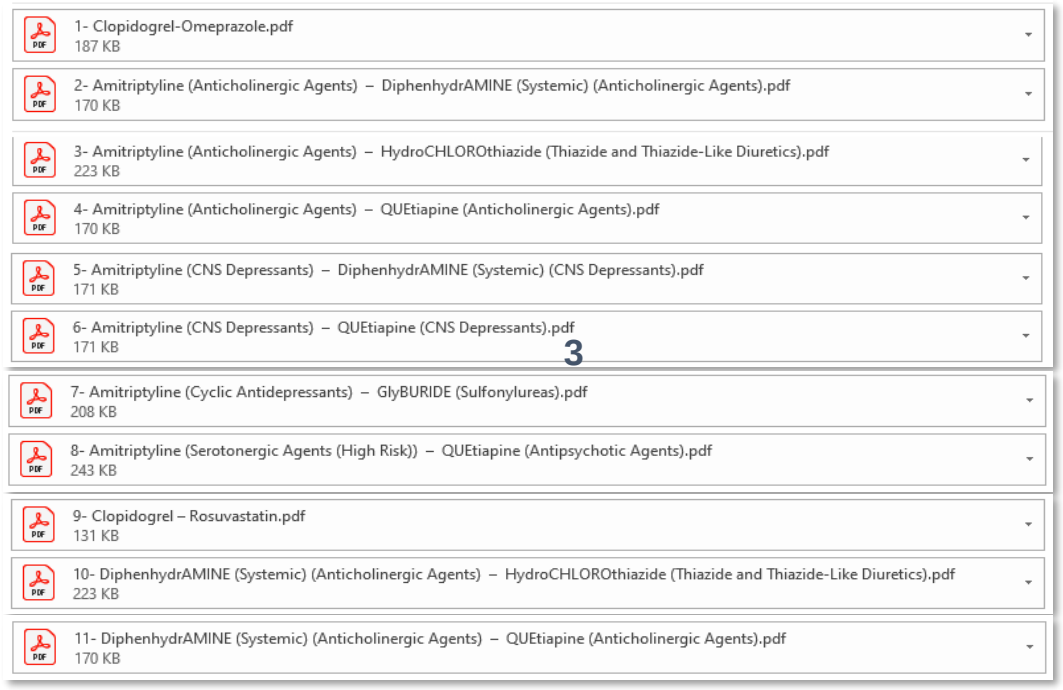


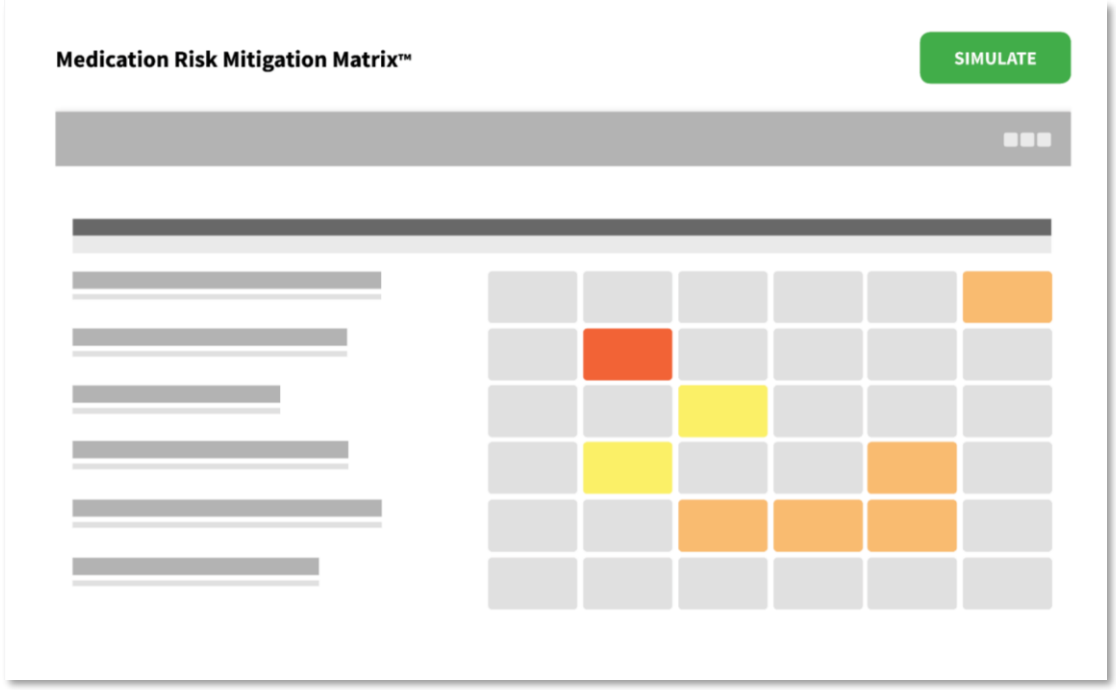
This one-to-one drug interaction software is more than four decades old, and is embedded in EHRs, pharmacies, PBMs, etc.

MedWise®

This software **assesses the combined risk of a patient's medications in aggregate** and guides pharmacists and prescribers toward individualized medication decision support

Taking complex medication regimen and make them easy to resolve





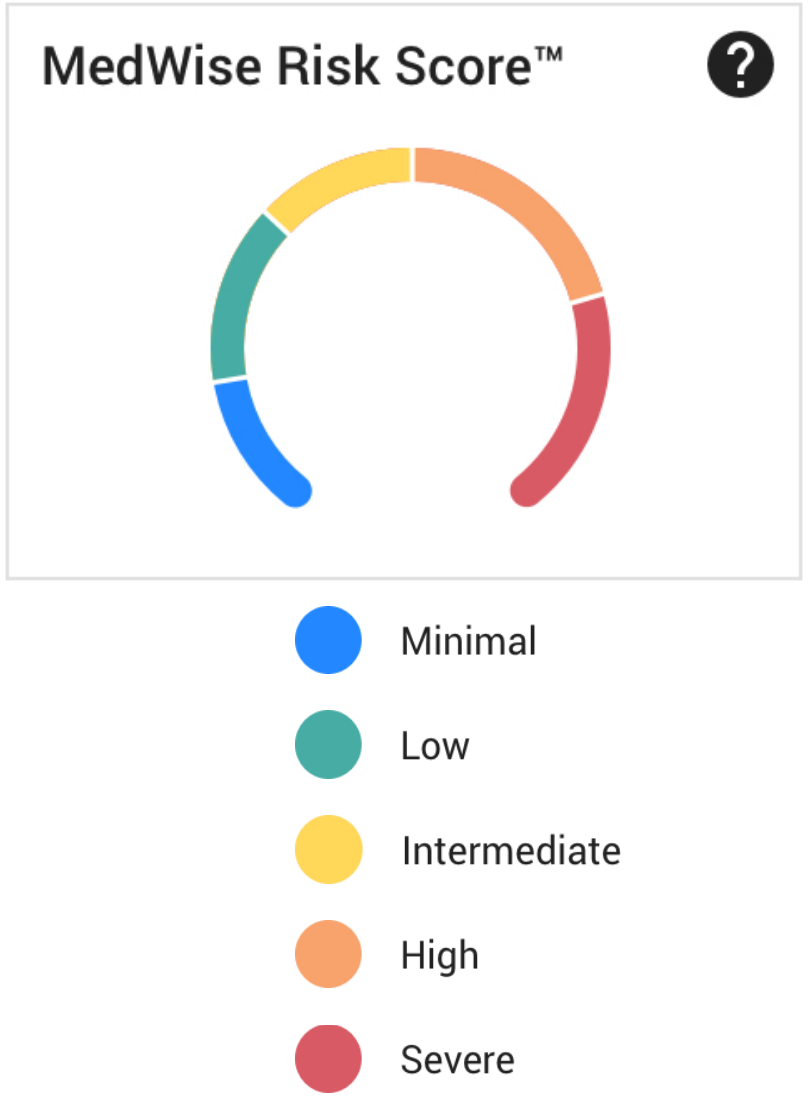
Lexi-alert system for the same patient: 21 pdf generated

VS.

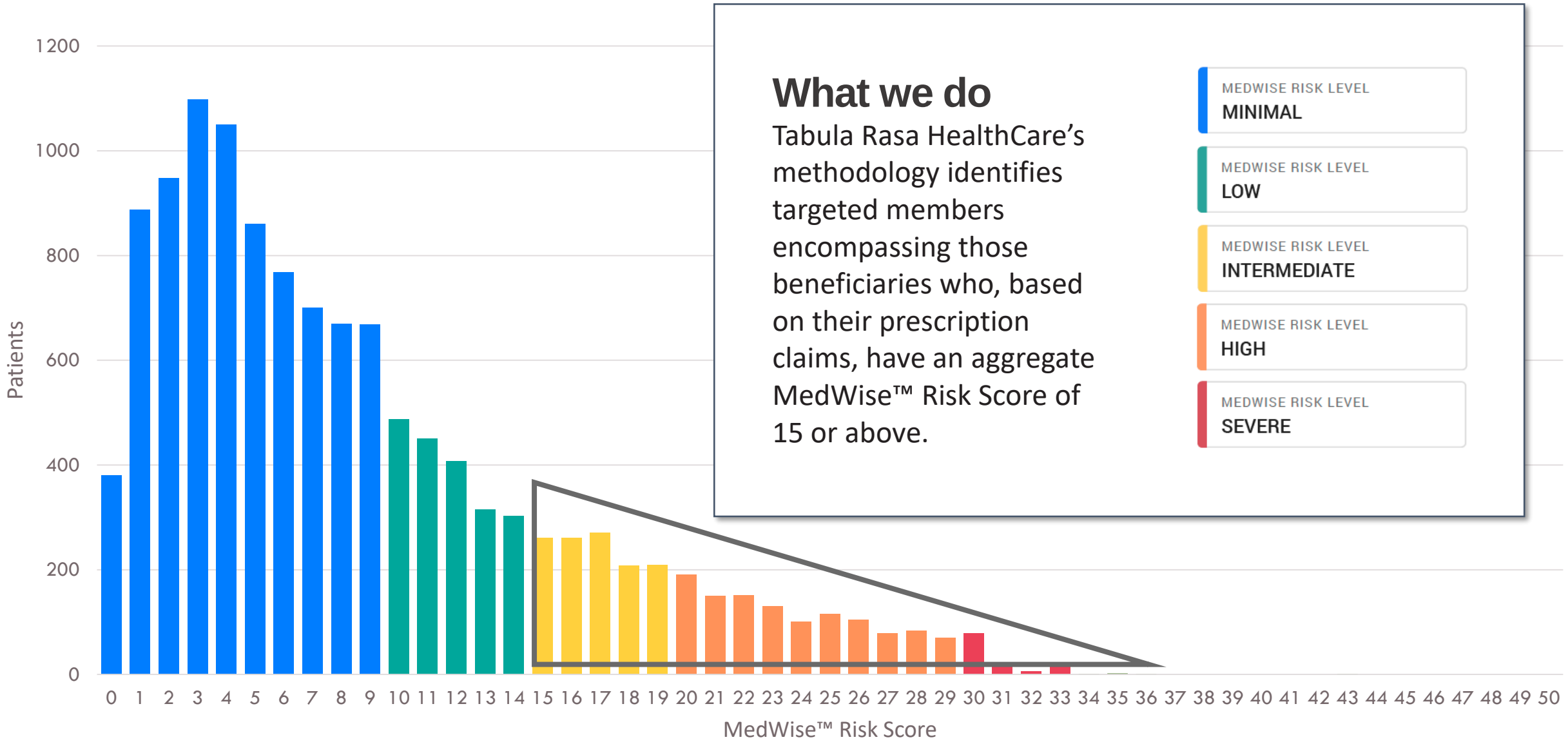
MedWise™ Medication Risk Mitigation Matrix™

MedWise Risk Score: A New Paradigm

- The MedWise Risk Score™ (MRS) represents a new paradigm in member targeting.
- Traditional member targeting is based on a combination of chronic disease, number of medications, and cost of medications.
- By contract, the MRS targets members that have alterable, pharmacological risk factors identified within their drug regimen for Adverse Drug Events (ADEs).
- The pharmacokinetic (PK) and pharmacodynamic (PD) characteristics of identified active ingredients feed algorithms that compute the MRS.



Stratify: Risk Stratify Population



What we do

Tabula Rasa HealthCare's methodology identifies targeted members encompassing those beneficiaries who, based on their prescription claims, have an aggregate MedWise™ Risk Score of 15 or above.

MEDWISE RISK LEVEL
MINIMAL

MEDWISE RISK LEVEL
LOW

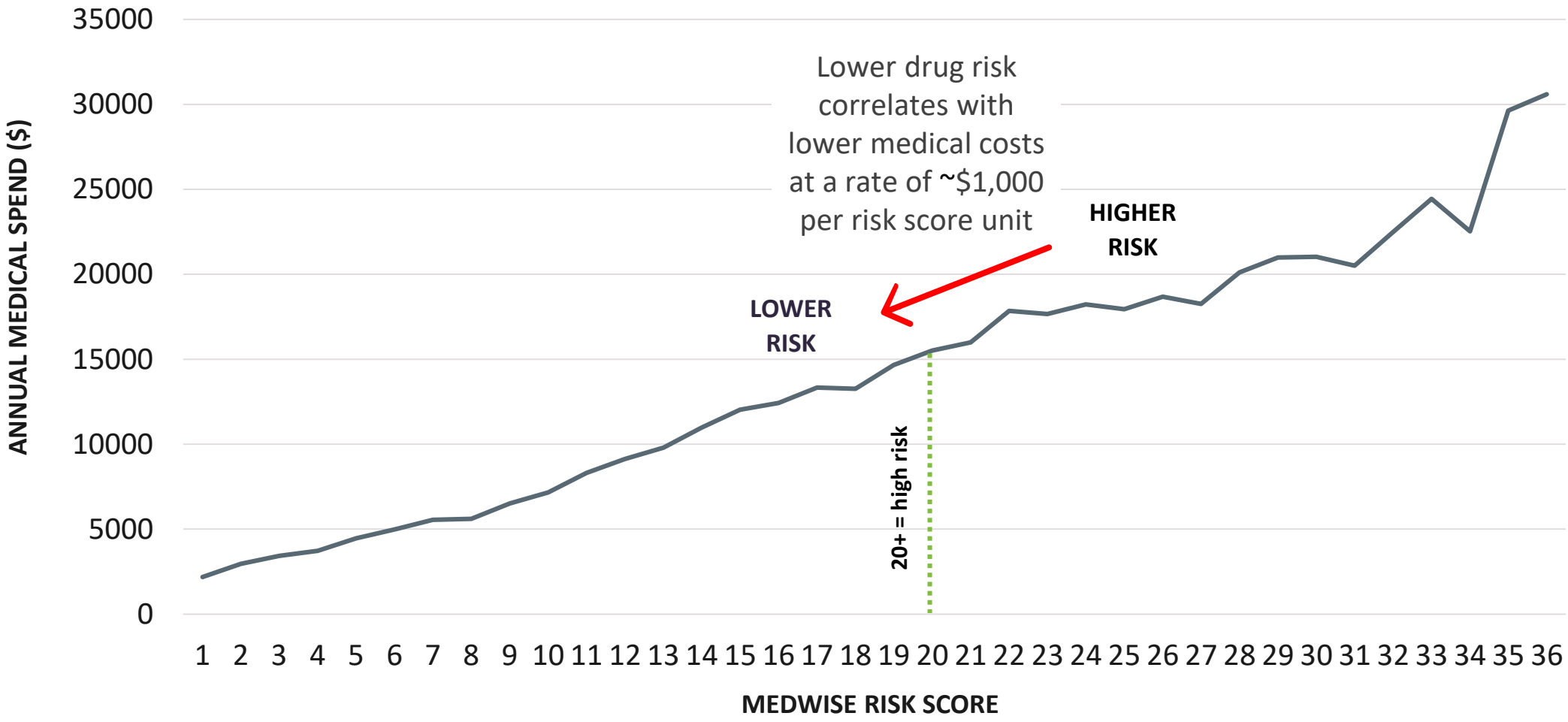
MEDWISE RISK LEVEL
INTERMEDIATE

MEDWISE RISK LEVEL
HIGH

MEDWISE RISK LEVEL
SEVERE

Risk Stratification – 0 to 50 – MedWise Risk Score™

An individual risk score of 15 has a 50% increase in medical spend. With a score of 20, the increase is 100%.



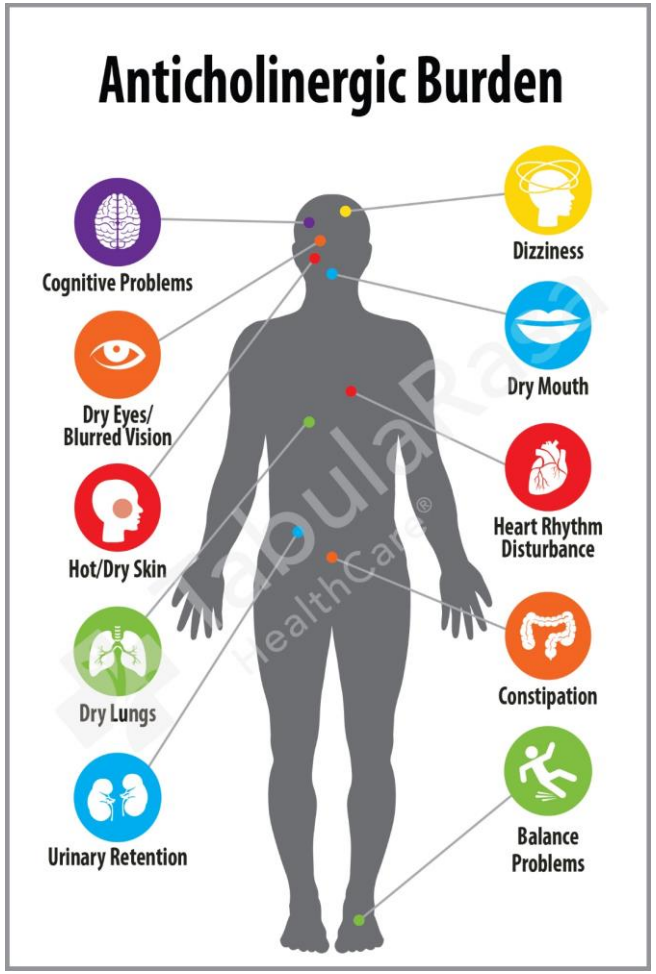
MedWise™ Proprietary Technology

Medication Risk Identification and Mitigation

Improve Patient Outcomes

The MedWise Risk Score™ is supported by the identification of risk factors and side effects

- **Adverse Event** data derived from the FDA Adverse Event Reporting System (FAERS)
- Side effects of medications with anticholinergic and sedative properties are more pronounced with higher accumulative **anticholinergic and sedative burden**, respectfully
- **Long QT syndrome** may lead to ventricular arrhythmias, such as Torsade de Pointes, that can lead to sudden death
- Substrates with greater affinities may cause **competitive inhibition**



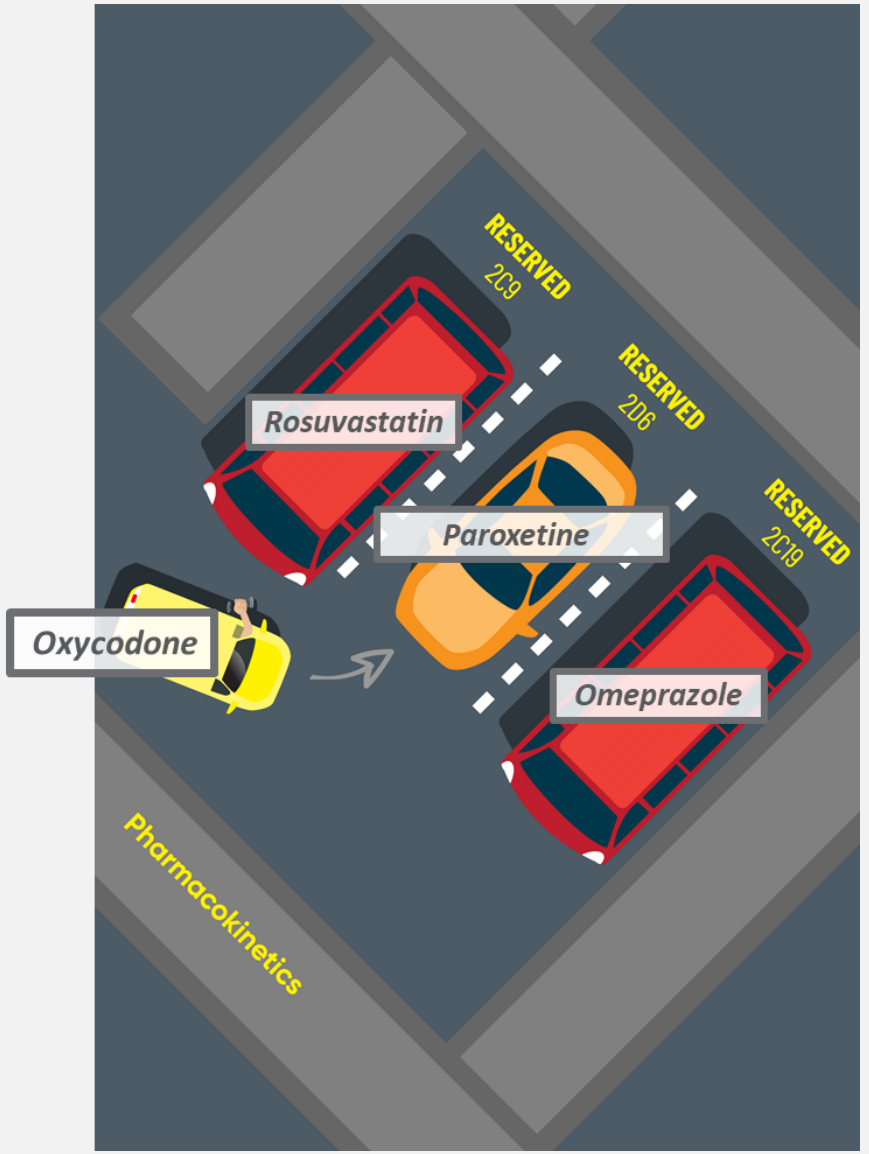
Competitive Inhibition

Approximately 80% of medications are metabolized via the CYP450 system.

- The mechanism can be understood, and simultaneous, multi-drug interactions can be predicted

Substrates of the CYP450 system show various degrees of affinity for CYP450 enzymes.

- Substrates with greater affinities may cause competitive inhibition of the metabolism of other substrates with lower affinities (same enzyme)
  - Active drugs can result in toxicity
  - Inactive drugs (pro-drugs) can result in ineffectiveness



Risks with Opioids

- 1999 to 2016, **prescription opioids** dispensed **nearly quadrupled**
  - 630,000+ drug overdose deaths during this time
- Non-fatal overdoses → **increased rates of ED** observations and hospitalization
- **80%** of opioid-related overdose deaths are **accidental or unintentional**
  - This is due, in part, to **drug interactions**

SAMHSA. Available at: https://www.samhsa.gov/data/sites/default/files/NSDUH-FRR1-2014/NSDUH-FRR1-2014.pdf
Rudd RA. *MMWR Morb Mortal Wkly Rep*. 2016;64:1378-82.
www.cdc.gov

TABULARASA HEALTHCARE®

Outcomes

Enhanced Medication Therapy Management (EMTM)

On September 28, 2015, CMS announced its first Part D Innovation Center model, **EMTM** to **decrease healthcare costs** and **drive therapeutic outcomes**…

5-year program (2017-2022)

5 Part D regions

- Region 7 (Virginia)
- Region 11 (Florida)
- Region 21 (Louisiana)
- Region 28 (Arizona)
- Region 25 (IA, MN, MT, NE, ND, SD, WY) – *we have over 400 pharmacies provided medications safety reviews*

6 Participating Sponsors

- Blue Cross and Blue Shield of Florida, Inc.
- Blue Cross and Blue Shield Northern Plains Alliance
- CVS Health
- Humana Insurance Company
- UnitedHealthcare
- WellCare Prescription Insurance Co.

Flexible and **Innovative**

Removes regulatory requirements of traditional MTM

Outcomes Focused

Provides standalone Part D plans with Part A and B claims data

Aligned Incentives

Program success is based on achieving 2% reduction in Part A and B

TRHC's EMTM Program

≈200,000
Members in stand-alone Prescription Drug Plans

15% (35,000)
High MedWise Risk Score™

15,130 Engaged in Year 1

19,756 Engaged in Year 2
(>400 pharmacists trained)

24,089 Engaged in Year 3

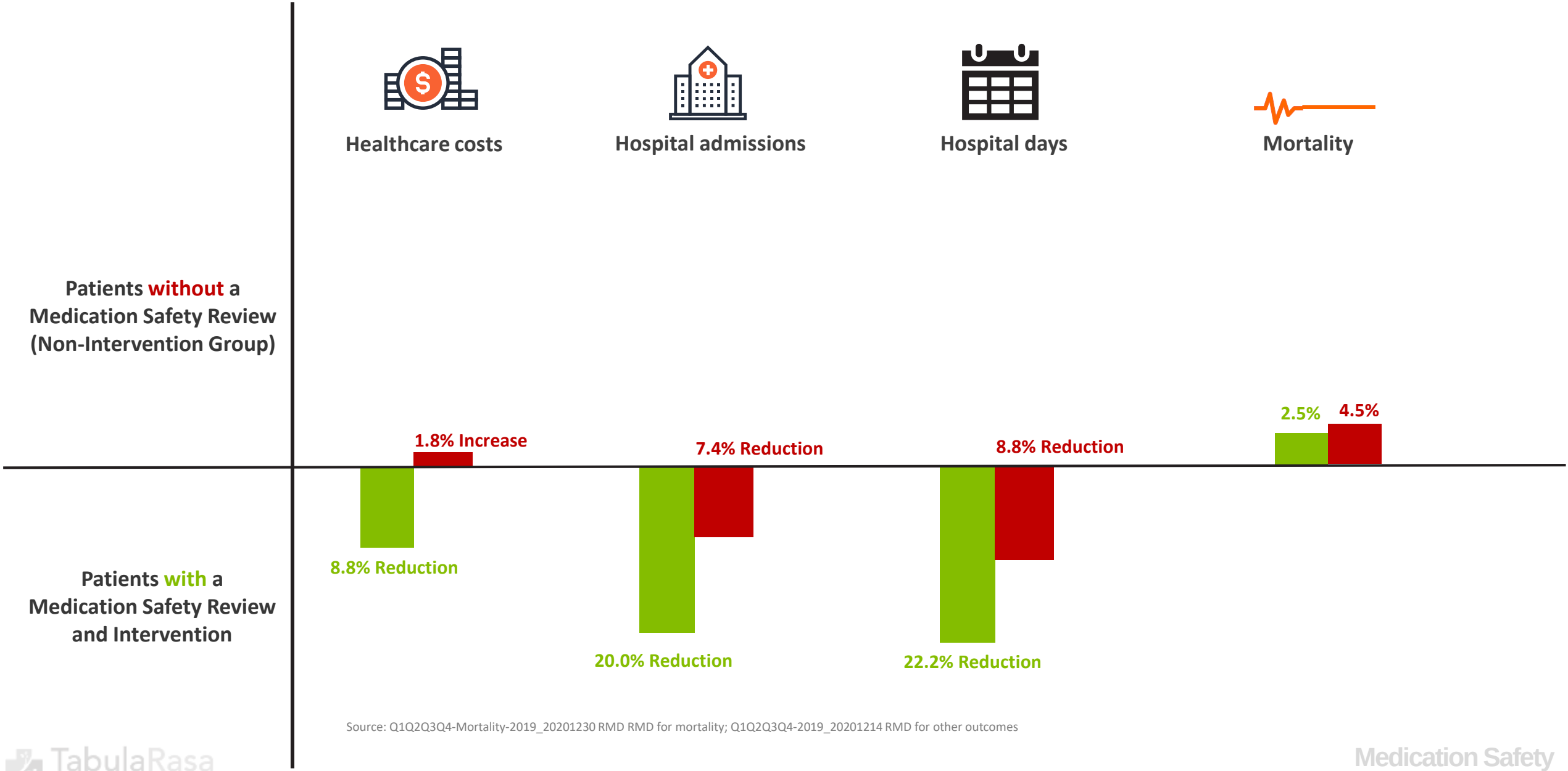
Enhanced MTM Outcomes

≈ 304,000
Unique Members in stand-alone PDP over 3 years

20% (43,000)
MedWise Risk Stratification identified those at high risk for medication-related problems

$129 million
Net savings, due most significantly to reductions in ER visits and hospitalizations

The Value of a Medication Safety Review™



Source: Q1Q2Q3Q4-Mortality-2019_20201230 RMD RMD for mortality; Q1Q2Q3Q4-2019_20201214 RMD for other outcomes

TabulaRasa HealthCare®

Medication Safety

The MedWise Risk Score is Predictive of…

Outcome	Risk Score of 10	Risk Score of 20	Risk Score of 30
Outpatient Visits (Average # Per 100 Members in 2019)	717 (706, 728)	1,170 (1,152, 1,188)	1,622 (1,591, 1,654)
Hospital Admissions (Average # Per 100 Members in 2019)	21 (20, 22)	44 (43, 45)	67 (64, 69)
Days in Hospital (Average # Days Per Member in 2019)	1.2 (1.1, 1.2)	2.6 (2.4, 2.7)	3.9 (3.8, 4.1)
Days in Skilled Nursing Facility (SNF) (Average # Days Per Member in 2019)	2.2 (2.0, 2.3)	4.8 (4.5, 5.0)	7.4 (6.9, 7.8)
ADEs (Parts A and B) (% of Members with ≥1 ADE in 2019)	5.0 (4.8, 5.1)	9.3 (9.1, 9.6)	13.7 (13.3, 14.1)
Falls (Parts A and B) (% of Members with ≥1 Fall in 2019)	8.8 (8.6, 8.9)	15.3 (15.0, 15.6)	21.8 (21.3, 22.3)
Mortality (% of Members Who Died in 2019)	4.4 (4.3, 4.6)	7.8 (7.6, 8.1)	11.2 (10.7, 11.6)
Total Cost (Parts A/B) (Average $ Per Member in 2019)	$9,005 ($8,818, $9,193)	$16,574 ($16,267, $16,881)	$24,143 ($23,616, $24,670)

Increasing risk score is associated with poorer clinical outcomes and higher costs.

Source: PSM-Mortality-Q3Q4-2018_20201230 RMD for mortality; MRM_Story_Y18Y19_20201123 RMD for other outcomes

Cohort Criteria for Mortality: All members for whom death can be observed in 2019 and who have risk score information available in the second half of 2018. Members who became ineligible for the EMTM program partway through 2019 for a reason other than death are excluded.

Cohort Criteria for Other Outcomes: All members with uninterrupted eligibility for the 2019 EMTM program year

Sample: 184.258 for mortality; 195,541 for other outcomes

Note: For mortality, we examine the relationship between (a) the maximum risk score in the last six months of 2018 and (b) the likelihood of dying in 2019. For the remaining outcomes, we examine the relationship between (a) the maximum risk score in 2018 and (b) the corresponding outcome in 2018.

ESRD members are excluded.

Emergency Department (ED) visits have been removed due to a pending definition change.

TABULA RASA HEALTHCARE®

Kentucky Medicaid Medication Risk Reduction Program

Medication Risk Identification and Mitigation

NJ Senate Bill No. 887 - Timeline

Senate Bill No. 887

Sweeney, Stephen M. as Primary Sponsor
Greenstein, Linda R. as Primary Sponsor
Gopal, Vin as Co-Sponsor

01/27/2020	Introduced in the Senate, Referred to Senate Health, Human Services and Senior Citizens Committee
09/14/2020	Reported from Senate Committee as a Substitute, 2nd Reading
09/14/2020	Referred to Senate Budget and Appropriations
01/21/2021	Reported from Senate Committee with Amendments, 2nd Reading
01/28/2021	Passed by the Senate (32-0)
01/28/2021	Received in the Assembly, Referred to Assembly Human Services Committee
03/17/2021	Reported and Referred to Assembly Appropriations Committee

Committee Voting:

SHH 9/14/2020 - r/SCS - Yes {5} No {1} Not Voting {2} Abstains {0}
SBA 1/21/2021 - r/Sca - Yes {12} No {0} Not Voting {0} Abstains {0}

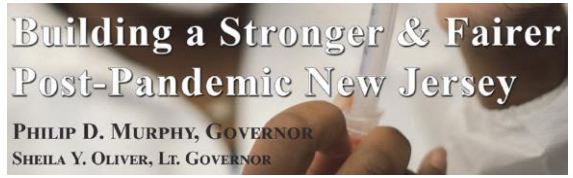
Assembly Bill No. 4790

Downey, Joann as Primary Sponsor
Benson, Daniel R. as Primary Sponsor

10/08/2020	Introduced, Referred to Assembly Human Services Committee
03/17/2021	Reported as an Assembly Committee Substitute and Referred to Assembly Appropriations Committee

Committee Voting:

AHU 3/17/2021 - r/ACS - Yes {7} No {0} Not Voting {0} Abstains {0}



The State of New Jersey Budget in Brief – Fiscal Year 2022 Link

"The Administration is also supportive of current legislation that will apply a risk reduction model to prescription drug services under the Medicaid program." – February 2021

Senate Bill No. 887

NJ Senate Proposes TRHC's Enhanced MTM Model for Medicaid…

3. The Division of Medical Assistance and Health Services in the Department of Human Services shall contract with a third party entity to apply a risk reduction model to prescription drug services provided under the Medicaid program established pursuant to P.L.1968, c.413 (C.30:4D-1 et seq.), for the purpose of identifying and reducing simultaneous, multi-drug medication-related risk and adverse drug events, enhancing compliance and quality of care, and improving health-related outcomes while reducing total cost of care in a measurable and reportable manner. In carrying out this purpose, the model, at a minimum, shall leverage Medicaid prescription drug claims data, pharmacokinetic and pharmacodynamic sciences, appropriate technologies, clinical call centers located in New Jersey and staffed by board-certified pharmacists licensed pursuant to P.L.2003, c.280 (C.45:14-40 et seq.), and include coordination of services with a network of local community pharmacies located throughout the State. For the duration of the contract, the division shall share the medical and pharmacy claims data for all Medicaid beneficiaries with the third party administering the model for the purposes of effectuating the model, which claims data shall include historical data.

NJ Senate Press Release (Sept 15, 2020)….

Yesterday, the Senate Health, Human Services and Senior Citizens Committee approved the Sweeney-Greenstein bill, which, among other things, requires the Department of Human Services to contract with a third party to apply a risk reduction model to prescription drug services under the Medicaid program.

Tabula Rasa HealthCare, Inc., a healthcare technology company, estimates that New Jersey will generate annual cost savings in excess of $80 million if such a model is applied to the Medicaid program.

Nationwide, adverse drug events cause health problems that contribute to more than 3.5 million physician office visits, 1.3 million emergency room visits and 350,000 hospitalizations, cause extended lengths of stay and are the leading preventable cause of hospital readmissions, Dr. Calvin Knowlton, Tabula Rasa's CEO, told the Senate Health Committee yesterday.

Testimony Before the Senate Health Committee – September 14

New Jersey Senate
Health, Human Services and Senior Citizens Committee

Testimony: Senate Bill No. 887

September 14, 2020
By
Calvin H. Knowlton, BSc Pharm, MDiv, PhD
CEO, Chairman & Founder, Tabula Rasa HealthCare, Inc. (Moorestown, NJ)

Chairman Vitale, members of th
CEO, Chairman & Founder, of T
testify today in support of a prop
Enhanced Medication Therapy I
reduce total cost of care across
(Moorestown) New Jersey, that
that these programs work and I

The Promise of Enhanced MTM for New Jersey Medicaid

New Jersey's approximate Medicaid population is comprised of 1,496,000 beneficiaries. (CMS, 2019). The Medicaid subpopulations of Aged, Blind and Disabled (ABD) with Medicare and those in Nursing Homes have a higher prevalence of polypharmacy and more closely mirror our extensive experience across Medicare markets. When we apply our Economic, Clinical and Humanistic Outcomes (ECHO) model of Enhanced MTM programs for government sponsored-plans, **we estimate that a Medicaid Enhanced MTM program like ours in New Jersey will generate annual cost savings in excess of $80 million**. When we add to these two cohorts to the balance of New Jersey's Medicaid population, the annual cost savings potential is even greater.

NJ Senate Bill No. 887 - Timeline

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Sweeney, Stephen M. as Primary Sponsor
Greenstein, Linda R. as Primary Sponsor
Gopal, Vin as Co-Sponsor

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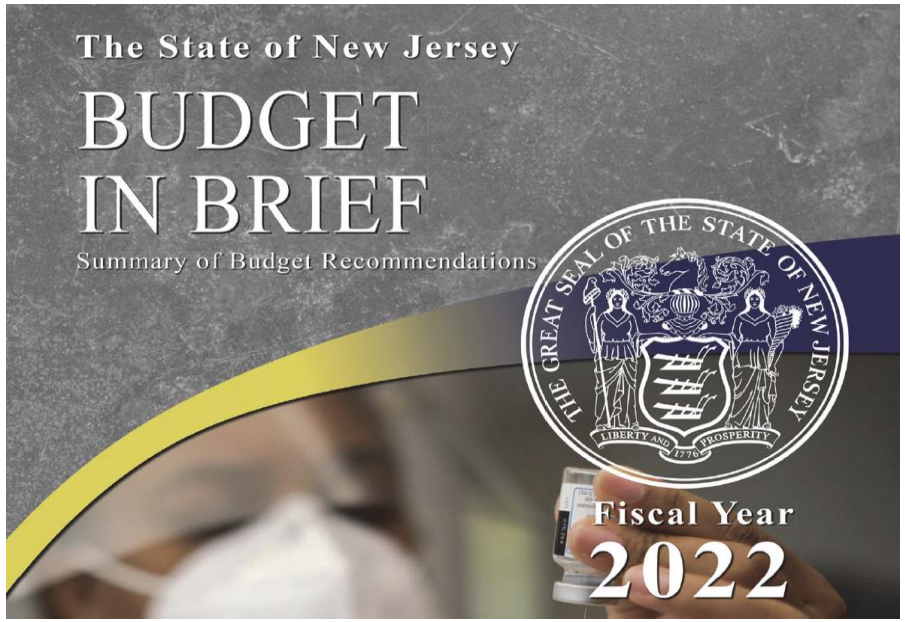
Assembly Bill No. 4790

Downey, Joann as Primary Sponsor
Benson, Daniel R. as Primary Sponsor

10/08/2020	Introduced, Referred to Assembly Human Services Committee
3/17/2021	Committee Voted – referred to Appropriations Committee



Savings Initiatives

In addition to the above health benefits reforms, the budget includes approximately $250 million in departmental savings, and one-time reductions of approximately $700 million due to the availability of federal resources in FY2022. The Administration was pleased to work with its partners in the Legislature to enact P.L.2021, c.4, which reforms the State procurement process to permit reverse

12

The FY2022 Budget

auctions for the procurement of goods and services outside of contracts for covered health care services. The Administration is also supportive of current legislation that will apply a risk reduction model to prescription drug services under the Medicaid program.

February 23, 2021

NJ Senate Bill No. 887 - Timeline

Senate Bill No. 887

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Greenstein, Linda R. as Primary Sponsor
Gopal, Vin as Co-Sponsor

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AHU 3/17/2021 - r/ACS - Yes {7} No {0} Not Voting {0} Abstains {0}
App Com - 06/16/2020 - Yes {11} No {0} Not Voting {0} Abstains {0}
Assembly – 6/21/2021 - Yes {71} No {0} Not Voting {0} Abstains {0}

The State of New Jersey Budget in Brief – Fiscal Year 2022 Link

"The Administration is also supportive of current legislation that will apply a risk reduction model to prescription drug services under the Medicaid program." – February 2021

Signed by Governor Murphy

7/2/2021 Approved P.L.2021, c.151.

Medicaid Medication Risk Reduction Program

- We help state Medicaid improve health-related outcomes and reduce total cost of care.

The **Core Components** of this Program Includes:

- The use of pharmacokinetic and pharmacodynamic sciences leveraging MedWise Science
- Innovative technical solutions to facilitate medication risk assessments that identify members who are at high risk for adverse drug events
- A nationwide network of community pharmacies and clinical contact centers staffed with certified pharmacists to deliver MedWise Safety Reviews

Value Proposition:

Through our data-driven technology and solutions, TRHC empowers state Medicaid to prevent adverse drug events and optimize medication regimens. TRHC can help reach the following goals:

- Improve member outcomes
- Reduce hospitalizations and emergency room visits
- Lower healthcare costs and manage risk

Our MedWise Science demonstrates real cost savings, providing positive returns on investment. TRHC is disrupting the fields of medication safety in multiple areas of healthcare, including through our participation in the CMS EMTM pilot program. With ample experience facilitating medication safety solutions, TRHC serves a variety of complex populations across the U.S.

MedWise® Risk Reduction Model for State Medicaid

Driven by unique and proprietary TRHC science and technology

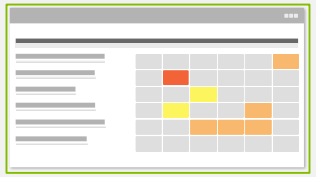
1 Receive pharmacy claims or medication profiles*

2 Perform simultaneous multi-drug analysis using MedWise

3 Identify members at highest risk for an adverse drug event

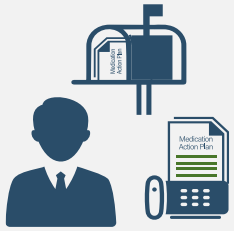
4 Conduct medication reconciliations

5 Complete Medication Safety Reviews™ using Medication Risk Mitigation Matrix™



6 Communicate science-driven interventions with members

7 Send action plans to members and physicians



8 Document and improve outcomes

Includes a review for specific chronic conditions (e.g., diabetes, bipolar disorder, etc.) to address issues like disease-induced phenoconversion – add pharmacogenomics to consult when indicated.

EMTM – Community Pharmacist service fee: $175/MSR – initial and $125/MSR for follow-up.

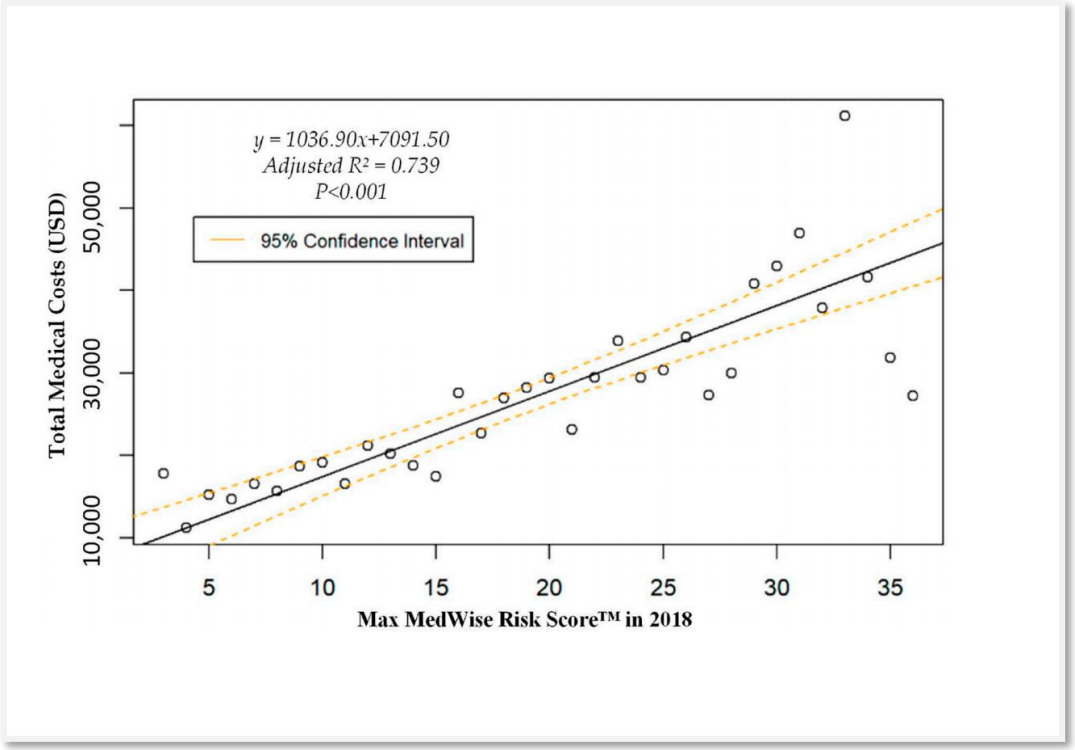
Tabula Rasa HealthCare®

Medication Safety

TABULARASA HEALTHCARE®

Additional Outcomes

Program of All-Inclusive Care for the Elderly (PACE) Results



- **Results:** as each unit increase in the MRS corresponded to over **$1,037 USD** in additional annual medical spending, three additional annual ED visits per 100 participants per year, and two additional hospitalizations per 100 participants per year.

Article

Association of a Novel Medication Risk Score with Adverse Drug Events and Other Pertinent Outcomes Among Participants of the Programs of All-Inclusive Care for the Elderly

David L. Bankes [1], Hubert Jin [2], Stephanie Finnel [2], Veronique Michaud [3], Calvin H. Knowlton [4], Jacques Turgeon [3] and Alan Stein [2,*]

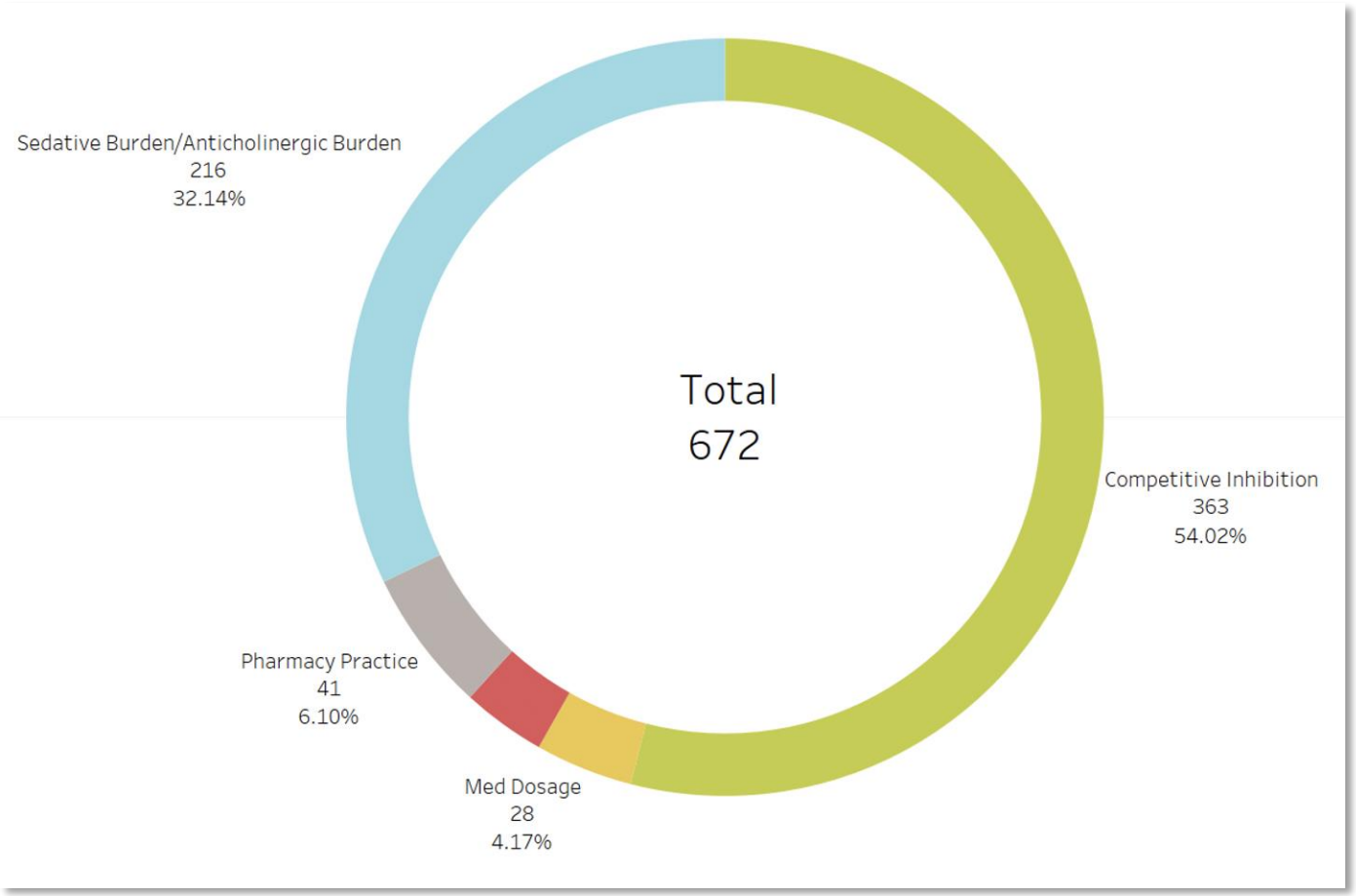
1 Applied Precision Pharmacotherapy Institute, Tabula Rasa HealthCare, Moorestown, NJ 08057, USA; DBankes@trhc.com
2 Healthcare Analytics, Tabula Rasa HealthCare, Moorestown, NJ 08057, USA; HJin@trhc.com (H.J.); SFinnel@trhc.com (S.F.)
3 Precision Pharmacotherapy Research and Development Institute, Tabula Rasa HealthCare, Lake Nona, Orlando, FL 32827, USA; VMichaud@trhc.com (V.M.); JTurgeon@trhc.com (J.T.)
4 Chief Executive Officer, Tabula Rasa HealthCare, Moorestown, NJ 08057, USA; CKnowlton@trhc.com
* Correspondence: AStein@trhc.com

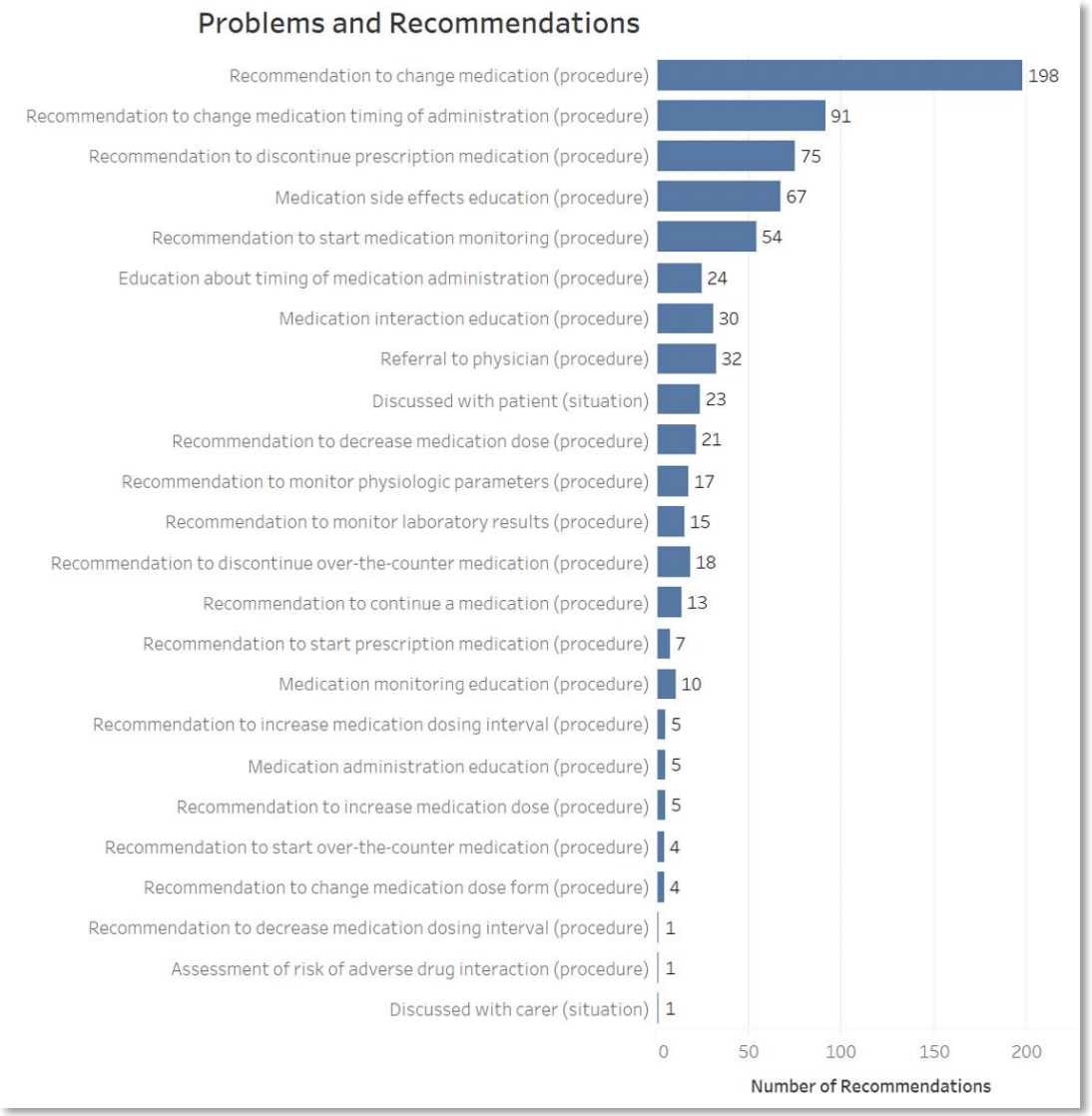
Received: 22 April 2020; Accepted: 15 May 2020; Published: 20 May 2020

Abstract: Preventable adverse drug events (ADEs) represent a significant public health challenge for the older adult population, since they are associated with higher medical expenditures and more hospitalizations and emergency department (ED) visits. This study examines whether a novel medication risk prediction tool, the MedWise Risk Score™ (MRS), is associated with ADEs and other pertinent outcomes in participants of the Programs of All-Inclusive Care for the Elderly (PACE). Unlike other risk predictors, this tool produces actionable information that pharmacists can easily use to reduce ADE risk. This was a retrospective cross-sectional study that analyzed administrative medical claims data of 1965 PACE participants in 2018. To detect ADEs, we identified all claims that had ADE-related International Classification of Diseases and Health Related Problems, 10th revision (ICD-10) codes. Using logistic and linear regression models, we examined the association between the MRS and a variety of outcomes, including the number of PACE participants with an ADE, total medical expenditures, ED visits, hospitalizations, and hospital length of stay. We found significant associations for every outcome. Specifically, every point increase in the MRS corresponded to an 8.6% increase in the odds of having one or more ADEs per year (OR = 1.086, 95% CI: 1.060, 1.113), $1037 USD in additional annual medical spending (adjusted R^2 of 0.739; $p < 0.001$), 3.2 additional ED visits per 100 participants per year (adjusted R^2 of 0.568; $p < 0.001$), and 2.1 additional hospitalizations per 100 participants per year (adjusted R^2 of 0.804; $p < 0.001$). Therefore, the MRS can risk stratify PACE participants and predict a host of important and relevant outcomes pertaining to medication-related morbidity.

https://www.mdpi.com/2226-4787/8/2/87

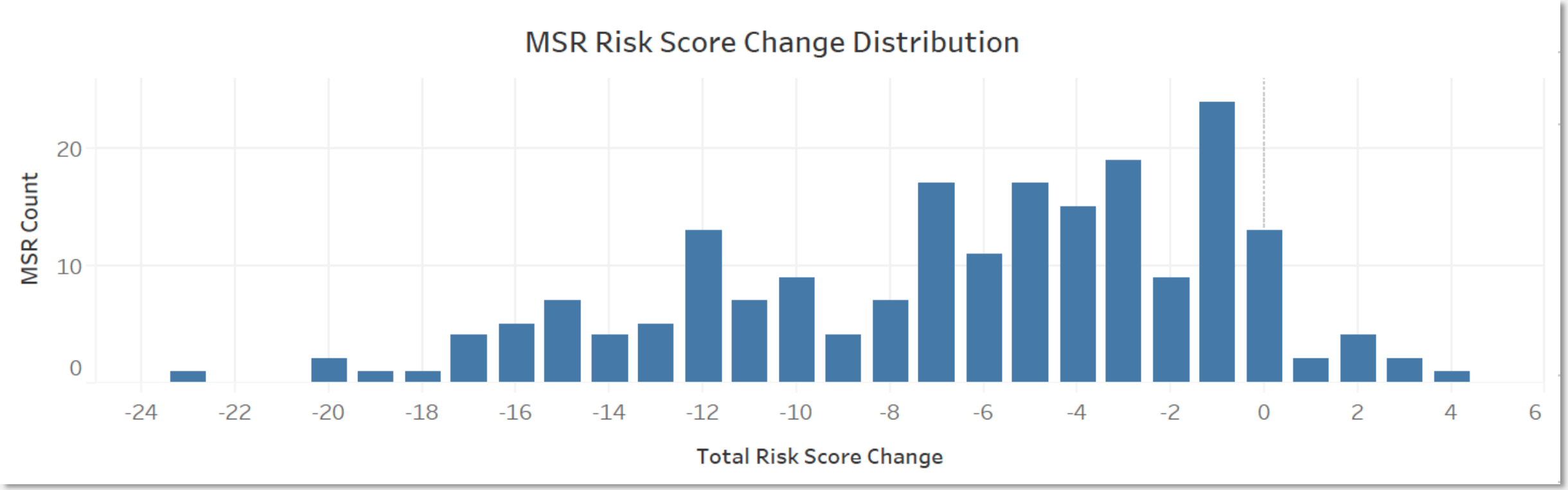
Summary of Interventions





Medication Safety Program Outcomes

Average risk score reduction of **6.35**



TRHC's ECHO – PACE, EMTM, Health Plans

A Preview of Outcomes Pharmacists Produce with the New MedWise System

Metrics

Medication Risk Management

PACE

Prospective/Monthly touches

Medication Risk Review

EMTM Service

Retrospective/One touch per year

SaaS

Hybrid

	PACE	EMTM Service	SaaS
PMPY ($) Documented Savings	$3,996 PMPY*	$2,818 PMPY**	$2,596 PMPY***
↓ Hospitalizations	42.9%	51%	22.5%
↓ ER Visits	20.4%	23%	28.2%
ROI ($)	**13:1**	**5:1**	**10:1**

** Overall savings based on hospitalization reduction across the entire PACE census.*
*** One and sometimes two telephonic interventions per year.*
**** Health Plan's pharmacists were trained in use of MedWise™, and collaborated with the plan's physicians and patients.*

ECHO = Economic, Clinical, and Humanistic Outcomes
ER = emergency room
PMPY = per member per year
ROI = return on investment
SaaS = software as a service

Reducing the MedWise Risk Score™ Can Reduce Premature Death

Recent study: Longitudinal association of a medication risk score with mortality among ambulatory patients acquired through electronic health record data

Authors: Amanda Rondinelli Ratigan, PhD, MPH, Veronique Michaud, PhD, Jacques Turgeon, PhD, Ravil Bikmetov, PhD, Gabriela Gaona Villarreal, MPH, Heather D. Anderson, PhD, Gerald Pulver, PhD, and Wilson D. Pace, MD

- Analyzed 427,000 patient EHRs
- Among patients with high (>20) risk score aged 30 to 49 years, a one-point increase in risk score correlated with an 11% increase in mortality
- Higher risk scores correlate independently with increased mortality

MedWise Risk Score	Patient mortality risk (all ages)*
≤ 9 *(Control group)*	1.00
10-14	1.65 *(1.52–1.79)*
15-19	1.81 *(1.65–2.00)*
20-29	2.25 *(2.03–2.49)*
≥ 30	2.58 *(2.06–3.25)*

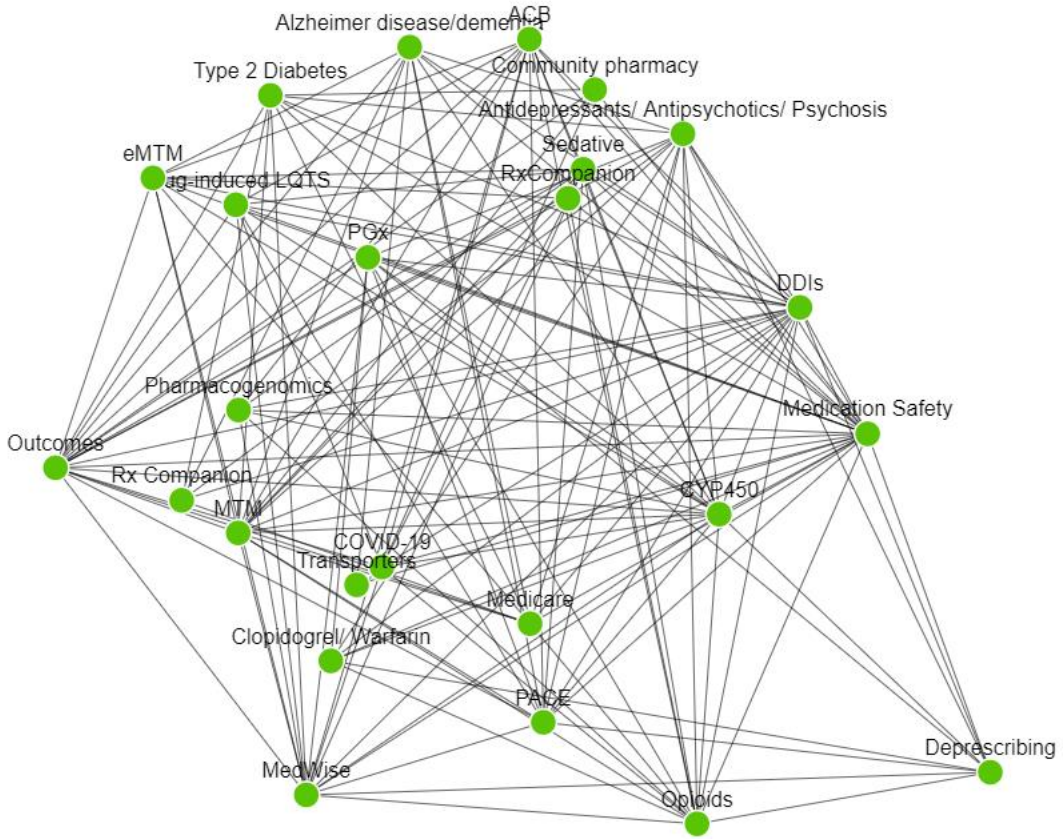
*Hazard ratio represents the likelihood of mortality at a given point in time

Ratigan AR, Michaud V, Turgeon J, Bikmetov R, Villarreal GG, Anderson HD, Pulver G, Pace WD. Longitudinal association of a medication risk score with mortality among ambulatory patients acquired through electronic health record data. *J Patient Saf*. 24 Mar 2021.

TRHC Publications (All Catalogued & Accessible Online)

+ Successfully authored at least one publication in a peer-reviewed journal **every week** of the year (2020) through current

- Anticholinergic burden
- Alzheimer's Disease/ Dementia
- Antidepressants/ Antipsychotics/ Psychosis
- Clopidogrel/ Warfarin
- Community pharmacy
- COVID-19
- Cytochrome P450
- Drug-drug interactions
- Deprescribing
- Drug-induced LQTS
- Enhanced MTM
- MedWise
- Medicare
- Medication safety
- Medication Therapy Management
- Opioids
- Outcomes
- Pharmacogenomics
- PACE
- RxCompanion
- Sedatives
- Transporters
- Type 2 diabetes



Source: https://www.tabularasahealthcare.com/research-development/publications-and-reports/

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Questions?

Next Steps…

- Mindy Smith, BScPharm, RPh, MHA, CMWA
Senior Vice President, Professional Affairs
msmith@trhc.com
703-927-2288

- Eugene O'Donnell, J.D.
Director, State Government Affairs
eodonnell@trhc.com
601-927-1422

- Brian Peltz, MS, RPh, FACHE
Area Vice President, Business Development
bpeltz@trhc.com
248-533-6906